1957

Study of some factors related to success in the first grade program of the Mankato public schools

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A STUDY OF SOME FACTORS RELATED TO SUCCESS IN THE FIRST GRADE PROGRAM OF THE MANKATO PUBLIC SCHOOLS

by

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B. A. Luther College, 1950

Presented in partial fulfillment of the requirements for the degree of Master of Arts

MONTANA STATE UNIVERSITY

1957

Approved by:

Chairman, Board of Examiners

Dean, Graduate School

AUG 1 9 1957

Date

8-13-57

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CHAPTER I

INTRODUCTION

Many schools and communities today are giving serious consideration to the question, "At what age should our children start school?" The many articles written on general school readiness and reading readiness in education journals and other publications indicate that educators, schools, and parents throughout the country are concerned.

THE PROBLEM

Statement of the problem. The policy of the Mankato, Minnesota public schools concerning entrance age requirements is that a child must be five years old by October 1 to start kindergarten or six years old by November 1 to enter the first grade. Exceptions are made only in the case of transfer students. Those children who happened to be born shortly before November 1 may therefore be nearly a full year younger that some other members of their class. It was the purpose of this study to attempt to ascertain whether or not these younger children have a more difficult time attaining success in the Mankato first grade program.

The data used pursuant to this purpose were taken from the office files of the elementary supervisor of the Mankato school system. Data were gathered pertaining to the (1) name, (2) chronological age, (3) mental age, (4) I.Q.,

and (5) achievement test score for each child included in the study. The data were then compiled and the results used to set up tables and figures designed to indicate any relationships between chronological age and mental age to achievement.

Significance of the problem. Educational and psychological research have indicated that all children do not mature at the same rate. Therefore, any single age requirement will not be entirely satisfactory. However, it is possible that one minimum age requirement could prove more satisfactory than another.

The Research Service of the Minnesota Education Association polled 478 school districts in Minnesota, (this would be nearly all of them), and found that a large majority of the schools require that a child be six years old by January 1 of his first grade year. This bureau also found that there were at least eight other plans in effect. Only two schools of the 84 percent replying used readiness tests as a criterion for entrance.[1]

It is quite possible then that many children have a difficult time in the first grade due to varying degrees of immaturity. The results of this study could prove of

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[1]A. L. Gallop, Director, "Survey of Kindergarten and Grade 1 Entrance Age Requirements in Minnesota Public Schools." (St. Paul: Minnesota Education Association Research Service, March, 1956) p. 5. (Mimeographed.)

value to the Mankato public schools and possibly to other systems as well when school officials are considering their minimum entrance age requirements.

SCOPE OF THE STUDY

Delimitations of the study. This study was limited to the 1953-1954, 1954-1955, 1955-1956 first grade students of the five elementary schools of the Mankato public school system. No child who was repeating the first grade was included in the study nor was any child who had been absent for an extended period (six weeks or more).

Since the Metropolitan Achievement Test[2] was given in May of the first grade year and the California Test of Mental Maturity[3] was given in October of the second grade year, those pupils who left the district during that time were necessarily eliminated from the study.

Limitations of the study. The 581 students studied were members of the first grade class of three consecutive years. Gathering data from three years' classes could tend to make the study more reliable than if data from one year's

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[2]Gertrude H. Hildreth, and others, Metropolitan Achievement Test, Primary Battery, Form S, (New York: World Book Company, 1947).

[3]E. T. Sullivan, W. W. Clark, E. W. Tiegs, California Test of Mental Maturity, Primary Edition, (Los Angeles: California Test Bureau, 1954).

class had been used. Variations in the results due to possible unknown factors would tend to nullify each other when data from more than one class were consolidated.

Written tests given at the primary level may not always be wholly reliable, especially for the slower student who may have a more difficult time reading, writing, and following directions. Group tests often do not measure as accurately as individually administered tests.

Data from only one test in a given area at best gives only an indication of the student's ability. This is especially so at the primary level. Any possible value of this study might be substantially enhanced by following these students through several years of their school career.

CHAPTER II

RELATED LITERATURE

Use of related literature. Literature was collected from several sources on general school readiness, reading readiness, and similar studies to indicate what research and authors have indicated and written concerning the aforementioned areas. Some of the articles deal with more than one type of readiness.

Current criteria in use are summarized at the close of this chapter and related to the findings in the subsequent development of the study.

REVIEW OF RELATED LITERATURE

Literature on general school readiness. Pupil readiness is considered to be essential for success in school. Schindler states that pupil readiness is a prerequisite to effective learning and that instruction without it may produce permanently negative effects.[1] Hays, after studying primary children in school, decided that children are learning all the time, although often they are not learning the things adults expect them to learn. Neither do adults

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[1]A. W. Schindler, "Readiness For Learning," Childhood Education, 24:301-304, March, 1948.

always know what they are learning. Children may learn to act as if they are learning if they realize that is what adults expect.[2] Such situations may arise when the children are not ready for the materials and teaching methods used.

King, in Oak Ridge, Tennessee, divided first graders into two groups, those under six years old and those who were six and older. This investigator found that the younger group's achievement was significantly lower. In addition to the lower achievement, the younger group had poorer attendance, more retentions, and had more trouble adjusting socially.[3] Hamalainen found essentially the same to be true of the underage children of Nassau County, New York. He also noted that the younger children had more emotional problems.[4]

Sheilds divided the 1954-1955 first graders of Missoula, Montana according to chronological age and found that the older half of the class had higher medial scores than did the younger group. The maximum medial difference

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[2]Dorothy T. Hayes, "When Are Children Ready To Learn," Progressive Education, 25:47-49, April, 1946.

[3]Inez B. King, "Effect of Entrance Age Into Grade I Upon Achievement in Elementary School," Elementary School Journal, LV (February, 1955), 331-336. Also see Appendix B.

[4]A. E. Hamalainen, "Kindergarten-Primary Entrance Age In Relation to Adjustment," Elementary School Journal, XXXVII, (March, 1937), 496-503.

was 0.2 grade levels.[5]

Literature on mental age as a criterion for entrance. Edmiston and Hollahan attempted to find measures that would enable them to predict achievement in the first grade. They write, "Mental age is probably a better criterion for entrance to school than is chronological age. However, readiness, social adjustment, health, socio-economic background, and motor coordination may be effective factors in the success of the first grader."[6]

Literature on reading readiness. Other writers have found that there may be factors other than chronological and mental ages involved in determining success in school. Betts writes,

> Undoubtedly some types of reading difficulties are caused by requiring a child to engage in reading activities before he is ready to participate. In this way children are taught to practice error. They are taught to dislike reading if they are forced into a situation where failure is sure to result.
>
> The emphasis in the reading program should be on prevention rather than correction. It is the point of view of the writer that most reading difficulties could be prevented by increasing the entrance age for the first grade.[7]

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[5]Shields, Reed L., "A Study of Some Factors That Are Related to Success and Failure in the First Grade Program of School District I, Missoula, Montana." Unpublished Master's Thesis, Montana State University, Missoula, 1956.

[6]R. W. Edmiston and C. E. Hollahan, "Measures Predictive of First Grade Achievement," School and Society, 63: 268-269, April, 1946.

[7]Emmet Albert Betts, The Prevention and Correction of Reading Difficulties (Evanston, Illinois: Row, Peterson and Company, 1936), p. 9.

Betts calls attention to one of the physiological aspects of young children by pointing out that 80 per cent of six-year-old children are normally farsighted, that is, they have short eyeballs. The eye coordination required for the noting of fine details is not fully developed.[8]

Morphett and Washburne of the Winnetka schools made a study of their reading program and report:

> A small percentage of children who began reading with a mental age of less than six years were able to achieve satisfactory reading progress, but in the group having a mental age of six to six years, six months there was a sharp rise in the percentage making satisfactory progress.[9]

They further imply that children entering first grade with a low mental age become discouraged in their attempts to read. This discouragement could develop into a mental set against reading and hamper all of their schoolwork during later years.[10]

It is possible that some teachers would not recognize these internal difficulties of the children in their care and subsequently begin to teach certain phases of the program before their pupils are ready. Such forcing could cause frustration and have lasting negative effects on the child.

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[8] Ibid., p. 10.

[9] Mabel Vogel Morphett and Carleton Washburne, "When Should Children Begin To Read?" Elementary School Journal, XXXI, (March, 1931), 499.

[10] Ibid., p. 496.

The literature covered included different views on when children could profitably start school and begin to read. Gates, commenting on a study by Raguse, writes, ". . . A mental age of 5.0 at the beginning of the year, other things being satisfactory, is sufficient for learning to read satisfactorily."[11] Gates follows this statement concerning rather low mental age possibilities with the qualification:

> Statements concerning the necessary mental age at which a pupil can learn to read are essentially meaningless. The age for learning to read under one program with the method employed by one teacher may be entirely different from that required under other circumstances.[12]

Keister found that it is possible for children who enter first grade before they reach the age of six years to make normal progress in reading during that year. By following the progress of these children through the elementary grades he concluded that the skills acquired by such underage students lacked permanence and tended to disappear during the summer months between grades one and two. Keister also found that these losses tended to be permanent and were not made up in succeeding years.[13]

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[11]Arthur I. Gates, "The Necessary Mental Age For Beginning Reading," Elementary School Journal, XXXVII, March, 1937), 502.

[12]Ibid., p. 506.

[13]B. V. Keister, "Reading Skills Acquired by Five-Year-Old Children," The Elementary School Journal, XLI, (April, 1941), 587-596.

The entrance age policy in Brookline, Massachusetts states that a child must be five years, nine months old by October 1 in order to be admitted to the first grade, except in cases where the child has a mental age of six years, two months. These chronologically young but mentally mature children may be admitted early. The early admittances have shown a statistically significant better average scholastically than did their older classmates, probably due to the higher I. Q.'s and selective screening.[14] Hobson, after studying the Brookline primary students, writes,

> Experience has shown that these selected under-age children are superior to their fellows academically but they cannot be distinguished physically after the kindergarten year, if then. They are less often referred to school officials for emotional, social, and other personality adjustments.[15]

Raybold's study indicated that mental immaturity was the chief cause of non-promotion in the first grade, while pupils entering first grade with a mental age of seventy-six months or more were almost always promoted.[16]

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[14]F. R. Cone, "Brookline Admits Them Early," Nations Schools, 55: 46-47, March, 1955.

[15]J. R. Hobson, "Mental Age As A Workable Criterion For School Admission," The Elementary School Journal, XLVIII, (February, 1948), 320-321.

[16]Emma Raybold, "Reading Readiness in Children Entering First Grade," Third Yearbook of Psychology and Educational Research Division, School Publication No. 185, (Los Angeles: Los Angeles School District, 1929), pp. 98-101.

Literature on sex differences and school achievement. Literature was available that purportedly showed that boys have a more difficult time in school than do girls.

Pauley, after studying students in the Omaha school system, states, "Boys are from three to six months behind girls in maturation at the five- to six-year chronological age." He suggests having different legal entrance ages for boys than for girls.[17]

Shields, in his study of the Missoula first graders, found that the girls median of achievement was 0.1 grade levels above that of the boys.[18]

Critique of the California Test of Mental Maturity. Garret, in the 1949 Mental Measurements Yearbook, writes,

> . . . (b) the pictorial tests are clear and well defined, (c) the tests of visual and auditory acuity and of motor co-ordination are undoubtedly useful additions to the examination.
> The authors offer no evidence to show that their test batteries are so constructed as to fulfill the conditions of I. Q. constancy.[19]

Critique of the Metropolitan Achievement Test,

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[17]F. R. Pauley, "Sex Differences and Legal School Age," Journal of Educational Research, 45:1-9, September, 1951.

[18]Shields, op. cit., p. 21.

[19]H. E. Garrett, The Third Mental Measurements Yearbook, O. K. Buros, Editor, (Rutgers University Press, New Brunswick: 1949). p. 223.

Primary Battery. The criticisms found concerning the primary battery were generally weighted toward the positive. Pullias reports,

> Those aspects of the Metropolitan batteries which one can evaluate on the basis of mere examination are very desirable. This is especially true of the primary battery. The pictures, maps, and typing are all clear and attractive. Nowhere is there evidence of the crowding that frequently makes a test confusing, particularly at the lower levels.[20]

While the claims made in respect to validity may be questionable, the facts concerning reliability indicate a high degree of excellence. "The available facts seem to indicate that the Metropolitan Achievement tests are among the better of similar tests now on the market."[21]

Summary of related literature. There seems to be little question but that a child must be ready for school if he is to achieve at least moderate success in school. Authors, however, are not unanimous in their opinions as to what constitutes readiness.

Most authors agree that mental age is more predictive of success in the first grade than is chronological age. A mental age of six years when starting school was most often cited as being the essential minimum. There appears to be

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[20]E. V. Pullias, The 1940 Mental Measurements Yearbook, O. K. Buros, Editor, (The Mental Measurements Yearbook, Highland Park, New Jersey: 1941). p. 27.

[21]Ibid., p. 27.

a rather sharp decline in the percentage of children achieving success in the first grade among those children who have a mental age of less than six years when they enter.

Few authors have made positive commitments concerning minimum chronological entrance age. Most research covered indicated that a chronological age of at least six years was most desirable. Children entering school under this age seemed to show a high percentage of failures similar to those in the same mental age group.

Similar studies seem to indicate that boys have a more difficult time attaining success in school than do girls. All research covered indicated that boys mature at a slower rate than do girls. Most authors place boys about six months behind girls at the six year age level.

CHAPTER III

PROCEDURE AND PRESENTATION OF DATA

Collection of data. Data were collected from the office files of the elementary supervisor of the Mankato, Minnesota Public Schools. Data were compiled concerning: (1) names; (2) chronological age as of September 1, the year of entrance into first grade; (3) mental age and I.Q. as determined by the California Test of Mental Maturity, Primary Battery; and (4) achievement as determined by the primary battery of the Metropolitan Achievement Test.

There were about 200 students from each of the 1953-1954, 1954-1955, and 1955-1956 first grade classes eligible for inclusion in the study. Since each year's class (1) attended the same schools, (2) were given the California Test of Mental Maturity in the same month of the year, and (3) were given the Metropolitan Achievement Test in the same month of their respective year, it was decided to treat the data from the three classes as one year's class. This might submerge any teaching differences and cause the results to appear in a less erratic pattern due to the larger and therefore probably more normal groups.

Since the Mankato Public Schools fail less than one per cent of the first grade students, no compilation was attempted concerning these retained students.

Treatment of data. Data were computed comparing the areas: (1) total group's achievement, girls' group achievement, and boys' group achievement; (2) chronological age to achievement; and (3) mental age to achievement.

The average I. Q. for each group was computed in case they would be needed when comparing group achievement scores.

PRESENTATION OF DATA

Total group, girls' group, and boys' group achievement. Figure 1, page 16, is a bar graph constructed to indicate the achievement scores for the total group, girls' group, and boys' group. The left side of the vertical axis is scaled to indicate the achievement scores from the lowest possible grade level to the 4.2 grade level. There is a 0.2 grade level differential between each score. A score of 1.8 should be interpreted to mean that this group did as well as most children do during the eighth month of the first grade. A score of 2.9 should be read as the ninth month of the second grade. The horizontal axis is divided into three groups, total group, girls' group, and boys' group. The middle 50 per cent of each group is indicated by a rectangle, the upper quartile of the group is represented by a line extending above the rectangle and the lower quartile by a line extending below the rectangle. The number in each group is indicated by N= (number) placed near

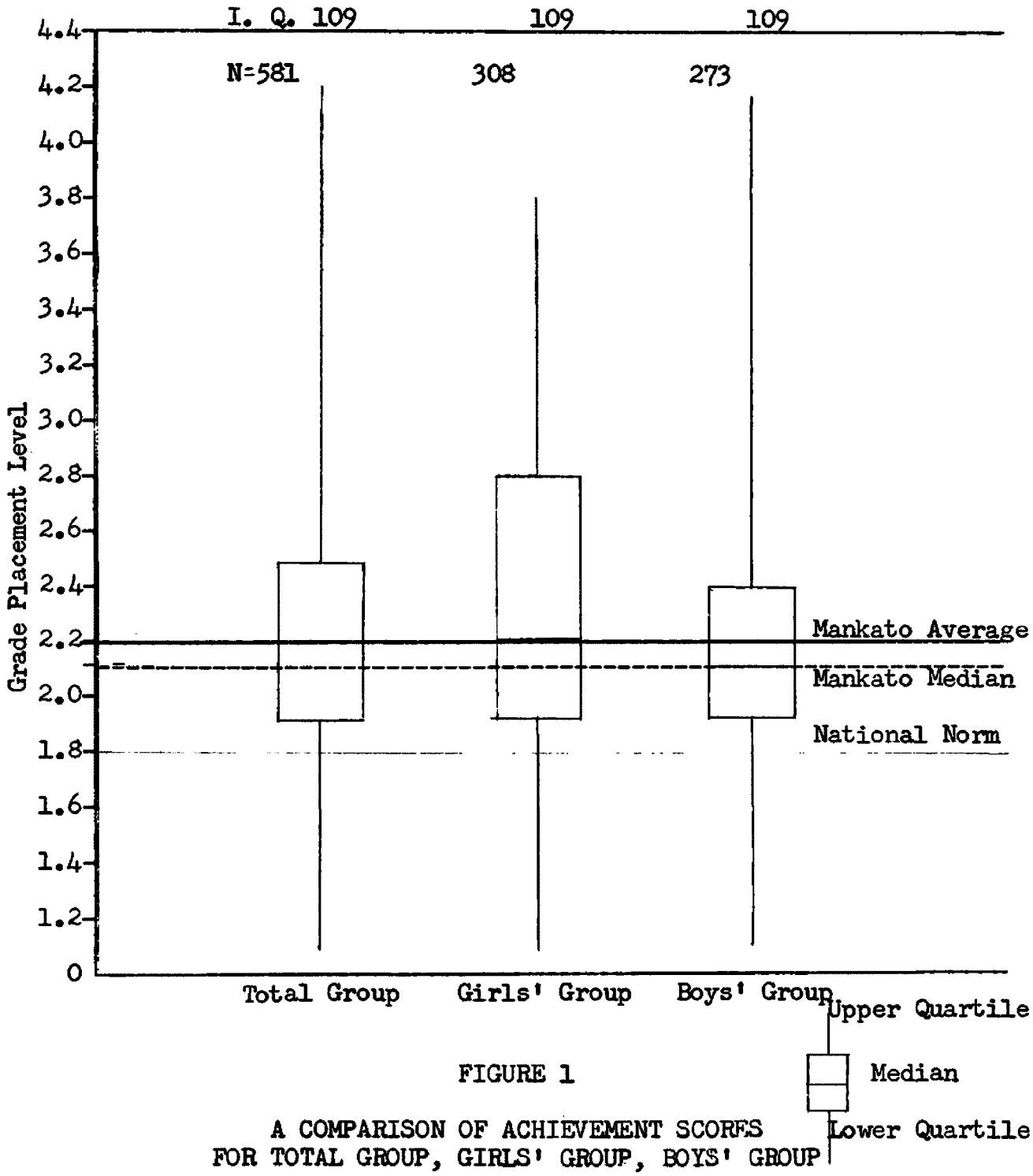

FIGURE 1

A COMPARISON OF ACHIEVEMENT SCORES FOR TOTAL GROUP, GIRLS' GROUP, BOYS' GROUP

the upper extreme of the upper quartile. The I. Q. is indicated by I. Q. = (number) placed directly above the bar representing each group. The median of each group is indicated by a horizontal line in the rectangle. The national norm of 1.8 for the test is represented by a horizontal line on the figure, the Mankato median by a dotted line, and the Mankato average by a wide dark line drawn horizontally across the figure.

Data of Figure 1 indicate the wide range of scores made on the achievement test. The scores of the 581 students in the study ranged from the 1.1 grade level to the 4.2 grade level, the average for the group being at the 2.2 grade level. The middle 50 per cent of the total group's achievement scores ranged from the 1.9 to the 2.5 grade levels. The median grade level for the total group was 2.1.

The bar for the girls' group indicates a slight narrowing of the range of scores; the lowest score achieved was 1.1 while the highest was 3.8. The middle 50 per cent of the girls' group scores ranged from the 1.9 to the 2.8 grade levels. The median score for the 308 girls was determined to be at the 2.2 grade level.

The bar representing the achievement of the 273 boys has the extremes of the total group with the middle 50 per cent clustered closer around the Mankato average. The range here was from the 1.9 level to the 2.4 level. The boys' median score of 2.1 was lower than the girls' median of 2.2.

The I. Q. of all groups represented in the figure was 109.

Previous studies have purportedly shown that girls have a marked superiority over boys in achieving in school, up to a half year at this primary level. The results of this study do not indicate any great difference in achievement between boys' groups and girls' group. The girls' group median was 0.1 grade levels superior to the boys'.

Differences between achievement scores of boys and girls - a test for significance. X_i = girls' scores

Y_i = boys' scores

$N_x = 308$

$N_y = 273$

$\Sigma X = 699.5$ $\quad\quad$ $\Sigma Y^2 = 1400.45$

$\Sigma Y = 602.6$ $\quad\quad$ $\overline{X} = 2.238$

$\Sigma X^2 = 1652.17$ $\quad\quad$ $\overline{Y} = 2.216$

(In this sample N rather than N-1 is used because the sample is sufficiently large to justify this selection.)

$$s_x^2 = \frac{N X^2 - (\Sigma X)^2}{N}$$

$$= \frac{308(1652.17) - (699.5)^2}{308}$$

$$s_x^2 = 0.20302$$

$$s_y^2 = \frac{273(1400.45) - (602.6)^2}{273}$$

$$s_y^2 = 0.23877$$

$$s_{\overline{X}}^2 = \frac{s_x^2}{N_x}$$

$$= \frac{0.20302}{308}$$

$$= 0.000659$$

$$s_Y^2 = \frac{0.23877}{273}$$

$$= 0.000875$$

$$\sigma_{\bar{X}-\bar{Y}} = \sqrt{\sigma_X^2 - \sigma_Y^2}$$

$$= \sqrt{0.000659 - 0.000875}$$

$$= .0.039$$

$$CR = \frac{\bar{X} - \bar{Y}}{\sigma_{\bar{X} - \bar{Y}}}$$

$$= \frac{2.238 - 2.216}{0.039}$$

$$= \frac{0.022}{0.039} = 0.56$$

$$0.56 < 1.96$$

There was no statistical significance in the difference between means in achievement of boys and girls as measured by the Metropolitan Achievement Test.

Effect of chronological age upon achievement. Data of Figure 2, page 20, indicate the average scores achieved on the Metropolitan Achievement Test, Primary Battery, Form S, by the 581 first grade students in the study, grouped by month of birth. Figure 2 is a bar graph constructed in the same manner as Figure 1, page 16, except that the students are grouped according to month of birth. The left edge of the vertical axis contains the achievement test score scale. The horizontal axis was divided into seven points of

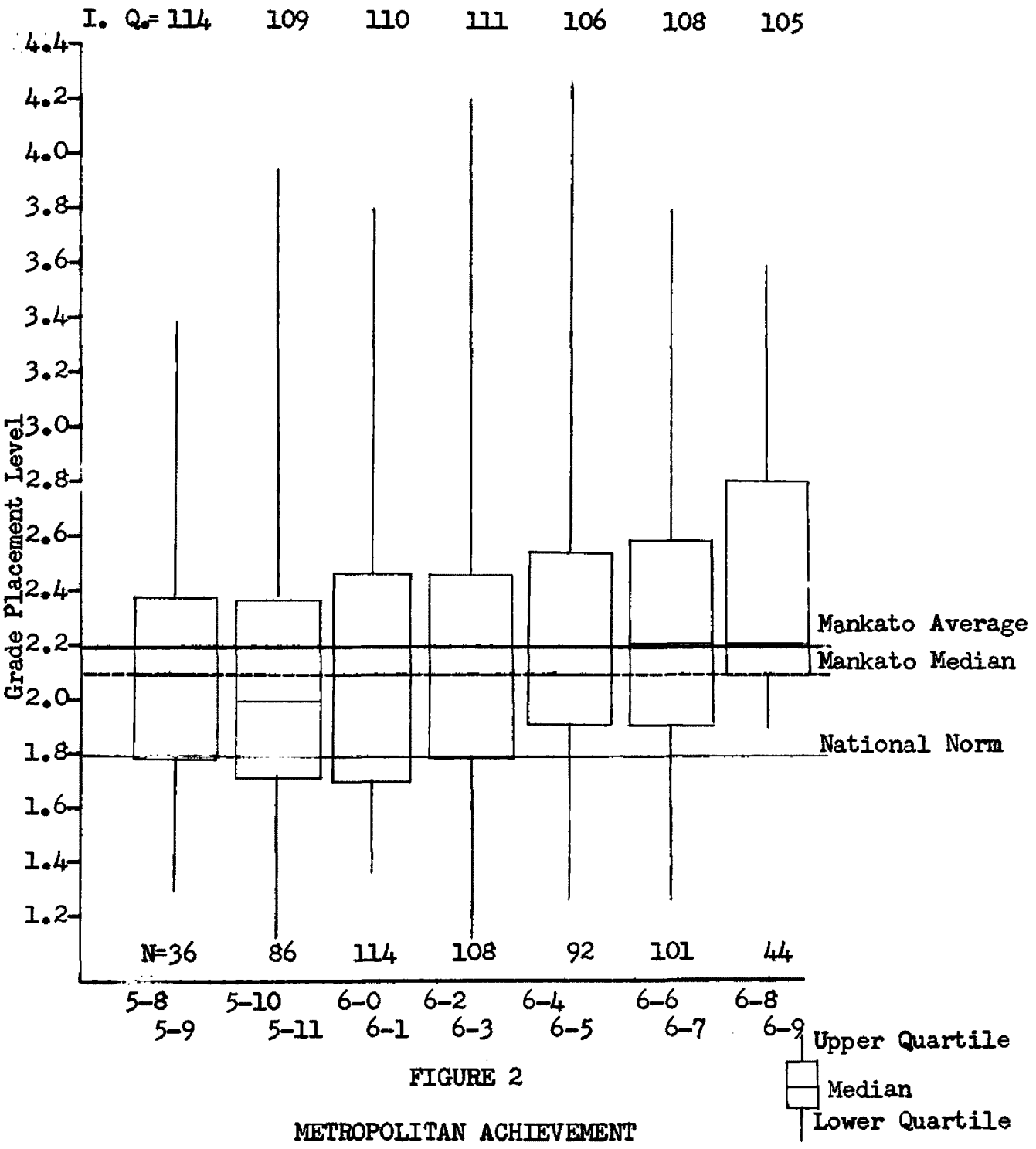

FIGURE 2

METROPOLITAN ACHIEVEMENT
AVERAGE BATTERY SCORES FOR 581
GRADE I STUDENTS GROUPED BY MONTH OF BIRTH

reference, representing entrance age in years, months. Each bar indicates the achievement of a group of students whose school entrance age span was within two months of each other. The bar on the left indicates the achievement of the group whose entrance age as of September 1, the year they entered first grade was 5-8 or 5-9. This should be read as five years, eight months and five years, nine months. The bar on the extreme right of the figure represents the achievement scores of those students who were six years, eight months old or older when they began first grade. All other bars represent a two month age span. The bars are constructed in the same manner as those of Figure 1, page 16. The number in each group was placed directly above the age designation near the bottom of the figure. The average I. Q. of each group was placed near the top of the figure directly above the bar for each group.

The number in each group ranged from lows of thirty-six in the 5-8, 5-9 group and forty-four in the 6-8 and over group to a high of 114 in the 6-0, 6-1 group. The lowest number of students in the middle five groups was eighty-six. The medians of achievement for the youngest three groups were 2.1, 2.0, and 2.1 respectively, while the medians of achievement for the oldest three groups were, in the same manner, 2.1, 2.2, and 2.2. The median for the 6-2, 6-3 age group was 2.1. The upper limits of the middle 50 per cent of the groups ranged from a low of 2.4 for the two youngest groups

to a high of 2.8 for the oldest group. The lower limits of the middle halves indicated approximately the same pattern, ranging from 1.7 for the 5-10, 5-11, and 6-0, 6-1 age groups to 2.1 for the oldest group. The average I. Q.'s for the youngest three groups was from 108 to 105. The average indicated I. Q. for the middle age group was 111.

A perusal of educational research will give the impression that younger children, especially those under six years, have an exceedingly difficult time attaining success in the first grade. This study does not strongly support this impression. While the younger group's medians were generally lower than the older group's, the extreme range of medians were but 0.2 grade levels apart. This narrowness of range may have been influenced by the slightly higher average I. Q.'s of the younger groups in the class.

Figure 3, page 23, presents a comparison of achievement test scores of the 308 girls and 273 boys in the study, grouped according to month of birth. Figure 3 was constructed in the same manner as Figure 2, page 20, except that there were two bars for each age group, one for boys and one for girls. The boys' bar was shaded.

Data of Figure 3 indicate that the boys tended to show greater extremes in scores on the achievement test than did the girls, but that those extremes were not far apart. The boys' extreme scores had a wider range in four of the seven groups. When the girls' scores showed greater range,

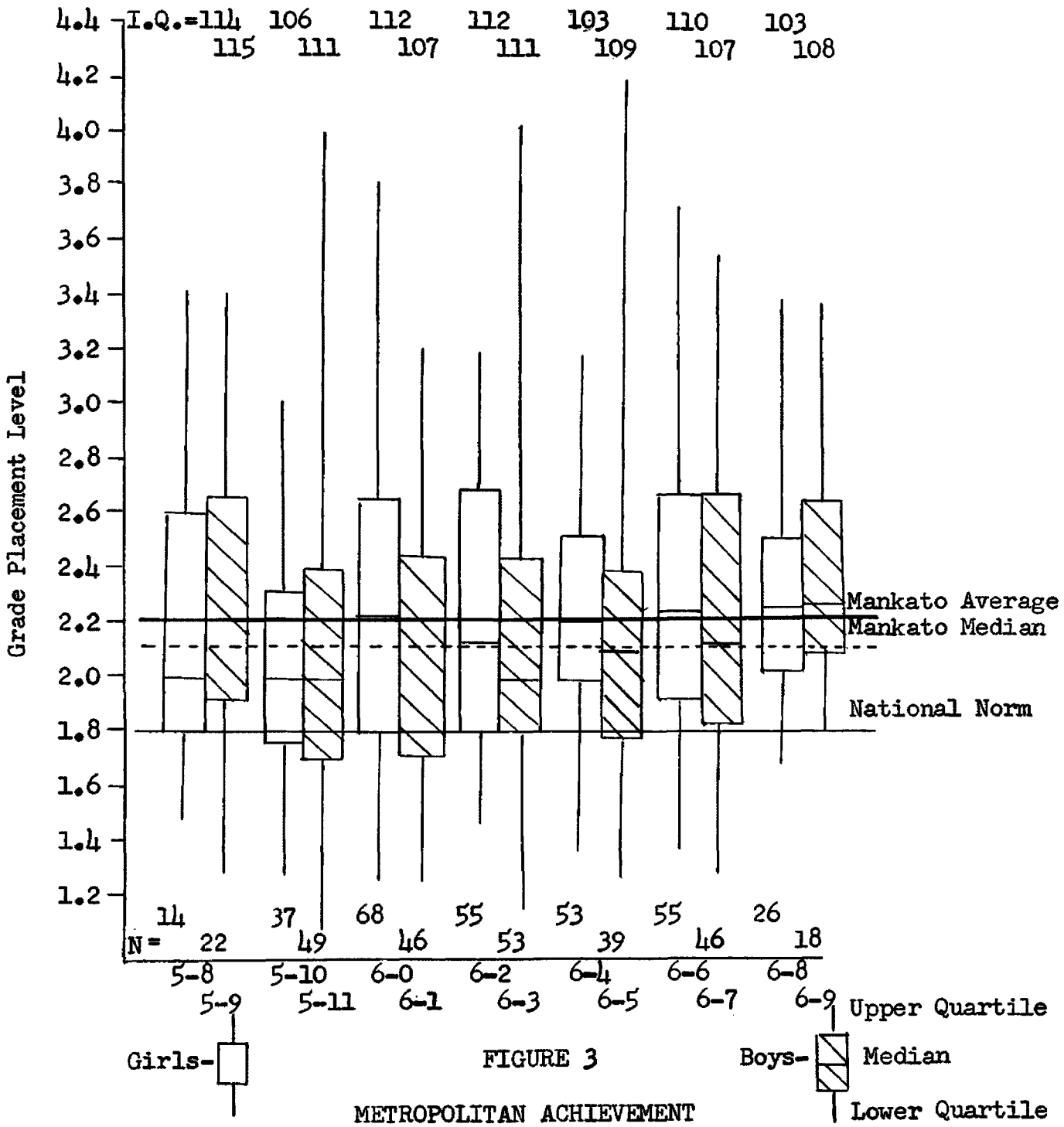

FIGURE 3

METROPOLITAN ACHIEVEMENT
AVERAGE BATTERY SCORES FOR 581
GRADE I BOYS', GIRLS' GROUPED BY MONTH OF BIRTH

the difference was not so great. The girls had a higher median score in five of the seven age groups, although the boys had a higher average I. Q. in four of the seven groups, the reader will recall from Figure 1, page 16, that the entire girls' group and entire boys' group had the same I. Q.

Again, according to data of Figure 3, this study does not strongly support previous studies in the contention that boys are a good deal behind girls in achievement in school. The difference between the boys' and girls' medians of achievement was not more than 0.1 grade placement levels for any age group.

Figure 4, page 25, is a line graph designed to indicate the per cent distribution of the 581 grade one students achieving below the national norm of 1.8 on the Metropolitan Achievement Test by chronological age groups. The per cent was scaled on the vertical axis on the left edge of the figure, ranging from 0 to 40 per cent with a 5 per cent differential. The horizontal axis was divided into four points of reference, indicating those students who entered first grade with a chronological age of from 68-72 months, 73-76 months, 77-80 months, and those who were eighty-one months old or older. The number in each group was indicated near the bottom of the figure directly below the age designation.

Data of Figure 4 indicate that of the 178 children

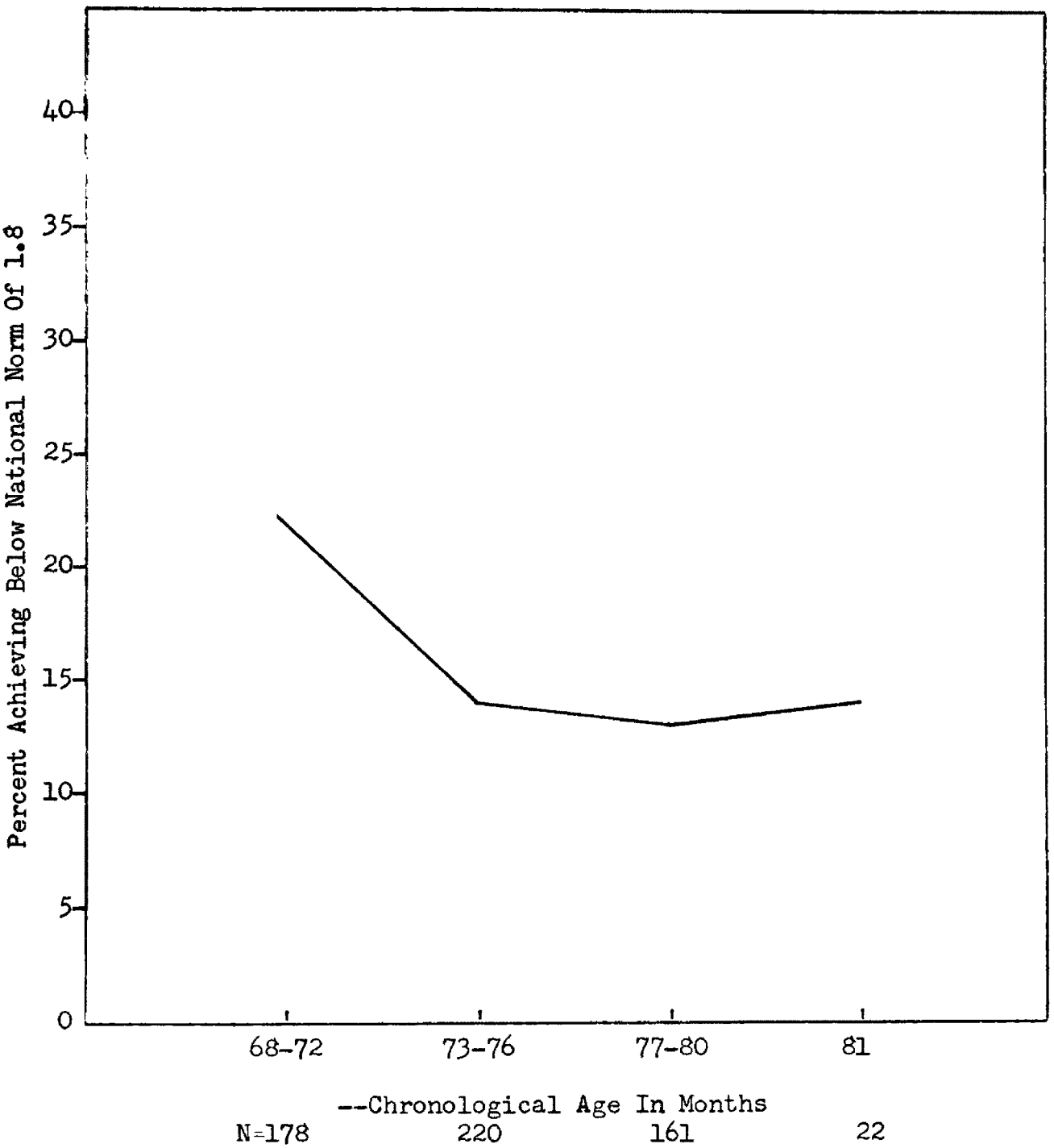

FIGURE 4

PERCENT DISTRIBUTION
OF 581 GRADE I STUDENTS BELOW NATIONAL
STANDARDIZED TEST NORM BY CHRONOLOGICAL AGE GROUPS

in the 68-72 month age group 22 per cent failed to achieve up to the national norm of the test. Of the 220 students in the 73-76 months age group 14 per cent were below the national norm and 13 per cent of the 151 children in the 77-80 month age group did not make a score of 1.8 on the test. There were only twenty-two students in the oldest age group and 14 per cent of these pupils fell below the national norm. Since there were only one-seventh as many children in the oldest age group as there were in the next largest age group, this percentage may not have been as reliable as that of the other groups. There were 8 per cent more of the children who were in the chronologically youngest group that failed to achieve up to the national test norm of 1.8 that were found in any of the other age groups.

The line on the graphed results of these findings levels off at the 73-76 months age level. Those children whose entrance ages were below the 73-76 month age level had a higher percentage of their group not achieving up to the national norm than did the older groups. Although the figure of 8 per cent more of the young group under-achieving is not strong this tends to corroborate similar studies in this area. These studies have generally indicated that children who start school before the age of six years tend to have a more difficult time than do their older classmates.

Figure 5, page 27, presents the per cent distribution of the 581 first grade students, by chronological age groups,

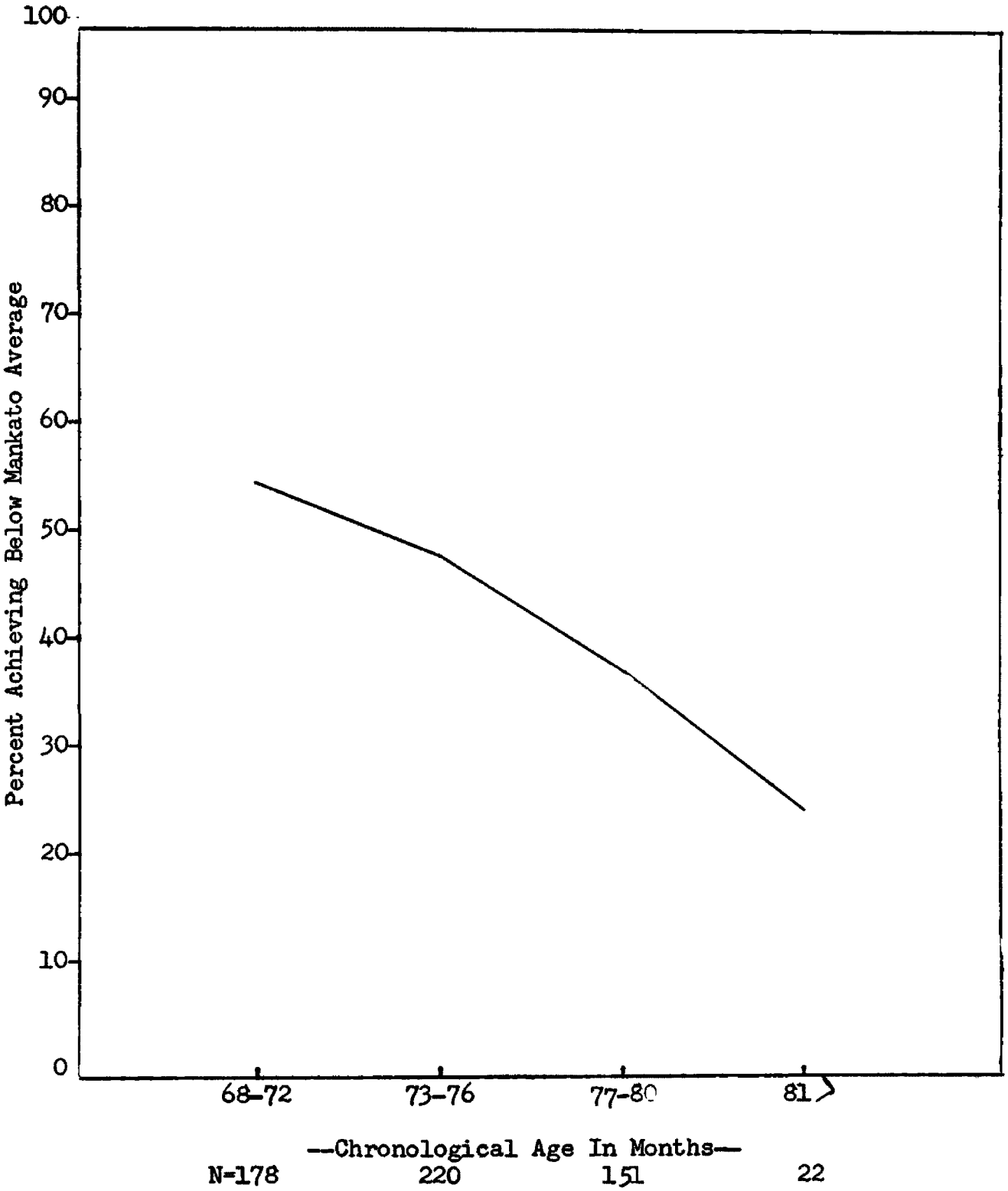

FIGURE 5

PERCENT DISTRIBUTION
OF 581 GRADE I STUDENTS BELOW
MANKATO AVERAGE BY CHRONOLOGICAL AGE GROUPS

who did not achieve up to the Mankato average on the achievement test. Figure 5 was constructed in the same manner as Figure 4, page 25, except that the percentage scale, on the left vertical axis had a 10 percentage point differential and ranged from 0 to 100 per cent.

Data of Figure 5 indicate that advancing chronological age had a greater negative effect on the per cent achieving below the national norm of 1.8. Of the 178 children in the group whose entrance age was from 68-72 months, 54 per cent did not achieve up to the Mankato average. Of the 220 students in the 73-76 month age group 47 per cent fell below the class average while 37 per cent of the 161 students in the 77-80 months group received a test score of less than 2.2. Twenty-three per cent of the 22 children whose age was eighty-one months or more when they started school failed to achieve equal to or above the Mankato first grade class average. The youngest group had 15 per cent more of its members achieving below the class average than did the next older group and 31 per cent more than did the group whose entrance age was eighty-one months or more.

For a further breakdown on the effect of chronological age upon achievement of the 581 students refer to Appendix "A", page 42.

The line on the graphed results of these findings, (Figure 5, page 27) is practically straight until it reaches the relatively small oldest age group that had

twenty-two members as compared to at least 161 in all other groups. This straight line through a thirteen month age span is not consistant with the findings of some previous studies. According to literature in this area there is usually a rather sharp drop-off in achievement below the seventy-two month age level. In this study the percentage of under-achievement increased steadily as chronological age decreased.

Effect of mental age upon achievement. The reader is cautioned to recall that the mental ages were determined as of the second month of the second grade year.

Figure 6, page 30, was constructed to indicate the per cent distribution, by mental age groups, of the 581 grade one students who failed to make a score on the achievement test equal to or above the national norm of 1.8. Figure 6 was constructed in the form of a line graph with the per cent scaled along the vertical axis on the left side of the figure. Mental age in months was scaled along the horizontal axis with five points of reference, eighty-four months and less, 85-94 months, 95-101 months, 102-108 months, and 109 months and over. The number in each group is placed directly below the mental age group designation.

Data of Figure 6 indicate that advancing mental age had a quite strong negative effect on the percentage of children who failed to achieve up to the national norm of 1.8 on the Metropolitan Achievement Test. In the group whose mental age was eighty-four months or less 33 per cent

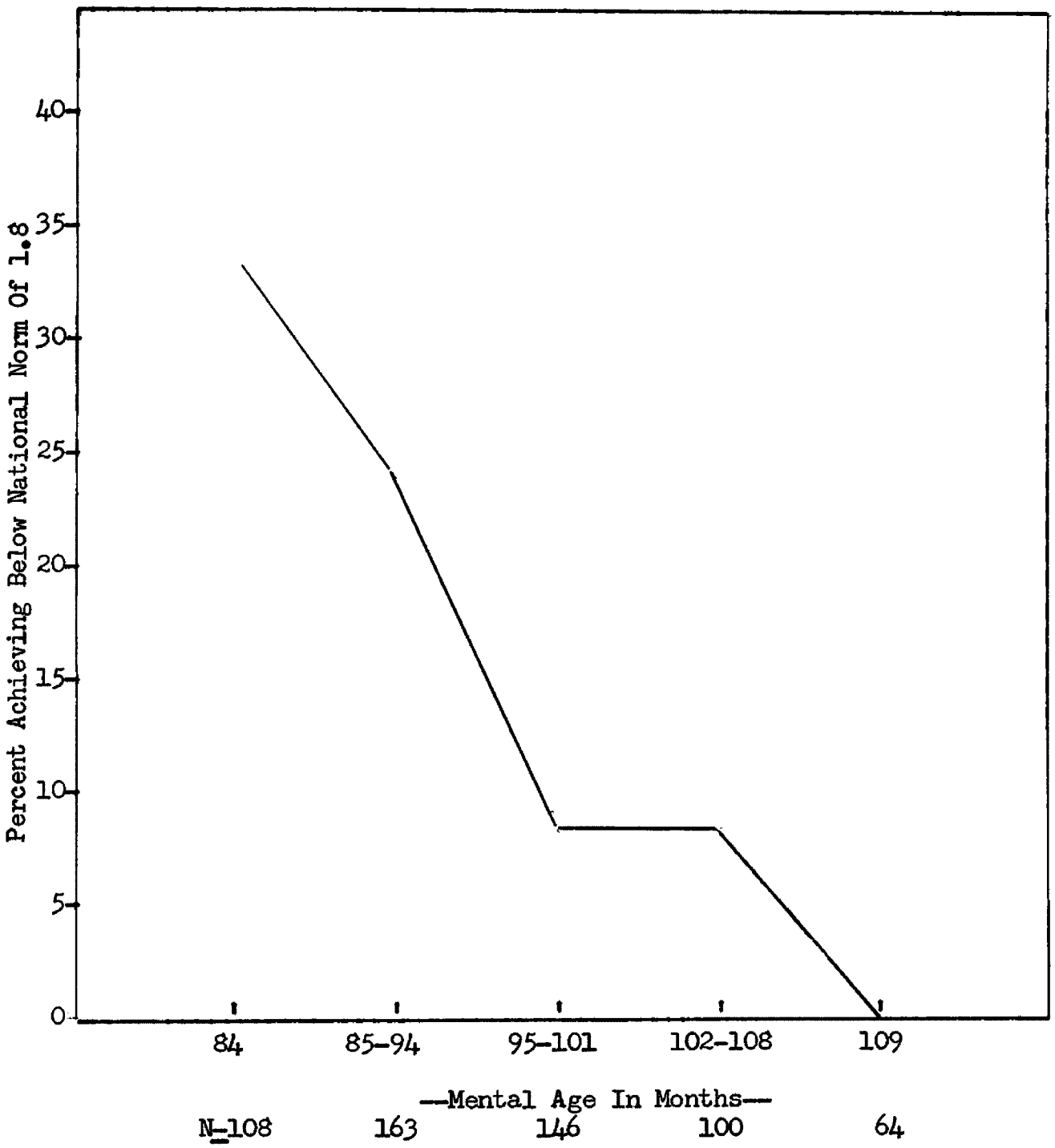

FIGURE 6

PERCENT DISTRIBUTION
OF 581 GRADE I STUDENTS BELOW NATIONAL
STANDARDIZED TEST NORM BY MENTAL AGE GROUPS

did not make a score indicating a scholastic achievement equivalent to the eighth month of the first grade. There were 108 pupils in this slowest group. Of the 163 children that had a mental age of 85-94 months, 23 per cent had an achievement score of less than 1.8. There were 8 per cent of the 146 students in the 95-101 mental age group and the 100 students in the 102-108 group that failed to achieve up to the national norm. None of the sixty-four pupils that had a mental age of 109 months or more made a score on the test that was below the national norm of 1.8.

The findings illustrated by Figure 6 are quite compatible with similar studies. There seems to be little question but that high and low mental age is predictive of high and low achievement respectively, with an intermediate stage between the extremes.

Figure 7, page 32, was constructed in the same manner as Figure 6, page 30, except that the per cent scale along the left vertical axis ranged from 0 to 100 per cent with a 10 percentage point differential.

Data of Figure 7 indicate a strong relationship between high mental age and achieving a high grade placement on the achievement test used. Of the 108 students that had a mental age of eighty-four months or less, 74 per cent achieved below the Mankato class average. The percentage of pupils who achieved below the class average went steadily downward as the mental age increased. In the 85-94 month

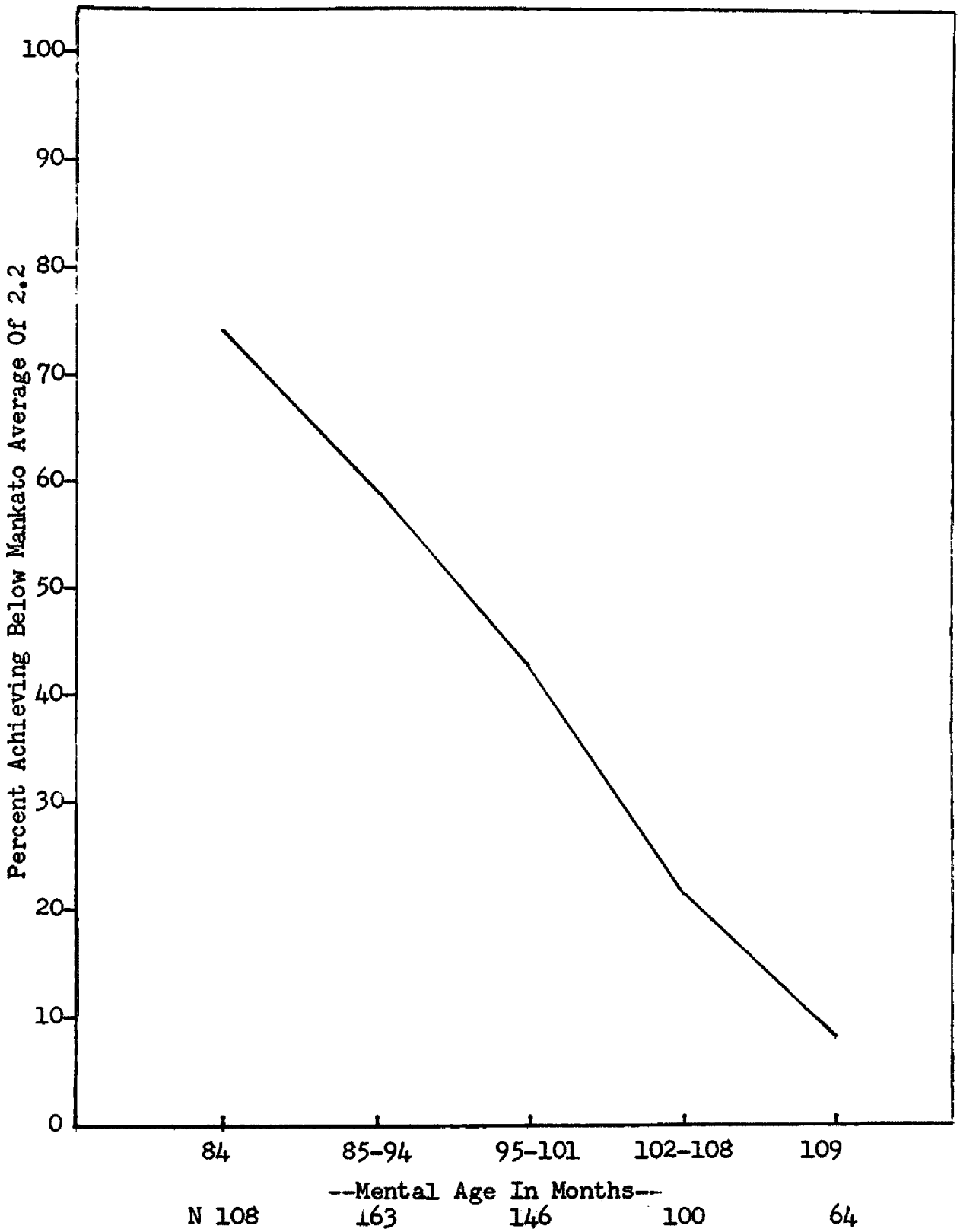

FIGURE 7

PERCENT DISTRIBUTION
OF 581 GRADE I STUDENTS BELOW
MANKATO AVERAGE BY MENTAL AGE GROUPS

mental age group 59 per cent of the 163 pupils failed to get an average score on the test. There were 42 per cent of the 146 members of the 95-101 mental age group and 21 per cent of the 100 students in the 102-108 mental age group who failed to achieve a score on the test that was equal to or above the class average. There were sixty-four students whose mental age was 109 months or more and just 8 per cent of these failed to achieve up to the Mankato class average of 2.2.

The findings of this study graphed in Figure 7, page 32, seem to agree with previous studies concerning mental age and success in school. There appears to be little doubt but that high achievement in grade one was closely associated with mental age in the group under study.

For a further breakdown of mental age influence on the 581 students' achievement refer to Appendix "A", page 42.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Comparison of related literature with this study. Previous studies indicate that in a high percentage of cases a mental age of six years is necessary for success in the first grade. There appeared to be a rather sharp breaking point at this six-year level. The graphed results of this study did not indicate any marked break-off point of mental age level in relation to success. Achievement increased as mental age increased, in nearly direct proportion.

Authors seem to be wary of suggesting a chronological age as being the most desirable one. The age of six years seems to be the most prevalent one of the few mentioned for entrance into school. This study indicated no certain starting age as being greatly superior to any other.

From previous studies we gather that girls have a statistically significant higher achievement average than do boys. The girls' group median in this study was 0.1 grade level above the boys' group median. This appears to be a smaller difference than was shown in most other studies, except Shields, and does not prove to be statistically significant.[1]

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[1] Shields, Reed L., "A Study of Some Factors That Are Related to Success and Failure in the First Grade Program of School District I, Missoula, Montana." Unpublished Master's Thesis, Montana State University, Missoula, 1956.

Total group, girls' group, and boys' group achievement. The median score for the 581 students in the study was 2.1, that is, the 2.1 grade placement level or the first month of the second grade. The national norm for this test is 1.8. The median girls' score was 2.2 and the median boys' score was 2.1. The Mankato average was 2.2. The boys' group tended to show greater extremes in scores obtained than did the girls' group but the scores of the middle 50 per cent of the girls were more spread out than were the same group of boys' scores. The average I. Q.'s of all groups was 109.

The achievement scores of the boys' group and girls' group in the study seem to show a smaller spread than is usually depicted in literature. The girls' group median score was just 0.1 grade level above the boys'.

Achievement by chronological age groups. The youngest three groups in this study had median achievement scores of 2.1, 2.0, and 2.1 respectively. The oldest two groups both had median scores of 2.2. The remaining two groups had median scores of 2.1. The maximum medial difference of 0.2 was found between the 5-10, 5-11 months and the 6-6 months and older age groups. This difference of 0.2 grade levels between the children who were less than six years old and those who were nearly a year older is less than most other studies have indicated.

There were 8 per cent more children in the group

whose starting age was from 68-72 months whose achievement was below the national standardized test norm than the percentage of any of the older groups. Previous studies indicate a sharp drop in achievement in children entering school before they are six years old. The 8 per cent drop-off found in this study is probably a smaller figure than has been found in most similar studies.

The graphed results of the per cent distribution of the 581 students achieving below the Mankato average, by chronological groups, show a nearly steady decline in the percentage of low achievers as the older groups are considered. The youngest group (68-72 months) had 31 per cent more of their group achieving below the Mankato average than did the oldest group (81 months or older). While these percentages could cause pertinent questions to be raised concerning entrance age requirements, the sharp break-off point at the six-year level indicated by literature is not present.

Achievement by mental age groups. The graphed findings of this study concerning the effect of mental age upon achievement indicate a strong positive correlation between mental age and achievement. This study supports most similar studies in this area. Some other studies show a sharper drop-off in achievement in the younger mental age groups.

Conclusions and recommendations. Literature and

data in this study indicate a strong positive relationship between increasing mental age and grade one achievement.

Some similar studies have shown a stronger positive correlation between advancing chronological age and grade one achievement than was indicated by this study.

Since the first grade, like any other, can be of utmost importance in a child's school career and later life, any school district might profit by a critical examination of its entrance requirements. According to some literature, this might be especially true in districts where children are allowed to enter first grade much before they are six years old, although this is not strongly supported by the results of this study. It might also be desirable, where financially feasible, to administer readiness tests to the younger children seeking entrance to school.

Further research might help to straighten out the incongruities present in existing literature. Additional studies of this nature, possibly following the children through several years of their school career, seem indicated.

BIBLIOGRAPHY

BIBLIOGRAPHY

Betts, Emmet Albert. The Prevention and Correction of Reading Difficulties. Evanston, Illinois: Row, Peterson and Company, 1936. pp. 462.

Garret, H. E. in The Third Mental Measurements Yearbook. O. K. Buros, Editor, The Mental Measurements Yearbook, Highland Park, New Jersey: 1941. 1047 pp.

Pullias, E. V. in The Third Mental Measurements Yearbook. O. K. Buros, Editor, The Mental Measurements Yearbook, Highland Park, New Jersey: 1941. pp. 1047.

Raybold, Emma. "Reading Readiness in Children Entering First Grade," Third Yearbook of Psychology and Educational Research Division, School Publication No. 185. Los Angeles: Los Angeles School District, 1929.

Cone, F. R. "Brookline Admits Them Early," Nations Schools, 55:46-47, March, 1955.

Edmiston, R. W. and Hollahan, C. E. "Measures Predictive of First Grade Achievement," School and Society, 63:268-269, April, 1946.

Gates, Arthur I. "The Necessary Mental Age For Beginning Reading," Elementary School Journal, XXXVII (March, 1937), 497-508.

Hamalainen, A. E. "Kindergarten-Primary Entrance Age in Relation to Adjustment," LII (March, 1952), 406-411.

Hayes, D. T. "When Are Children Ready To Learn?" Progressive Education, 25:47-49, February, 1948.

Hobson, J. R. "Mental Age as a Workable Criterion for School Admission," The Elementary School Journal, XLVIII (February, 1948), 312-321.

Keister, B. V. "Reading Skills Acquired by Five-Year-Old Children," The Elementary School Journal, XLI (April, 1941), 587-596.

King, Inez B. "Effect of Entrance Age Into Grade I Upon Achievement in Elementary School," The Elementary School Journal, LV (February, 1955), 331-336.

Morphett, Mabel V. and Washburne, Carleton, "When Should Children Begin to Read," The Elementary School Journal, XXXI (March 1931), 496-503.

Pauley, F. R. "Sex Differences and Legal School Age," Journal of Educational Research, 45:1-9, September, 1951.

Schindler, A. W. "Readiness For Learning," Childhood Education, 24:301-304, March, 1948.

Sheilds, Reed L. "A Study of Some Factors That Are Related To Success and Failure in the First Grade Program of School District I, Missoula, Montana." Unpublished Master's Thesis, Montana State University, Missoula, 1956.

Gallop, A. L., Director, "Survey of Kindergarten and Grade 1 Entrance Age Requirements in Minnesota Public Schools." St. Paul: Minnesota Education Association Research Service, March, 1956. pp. 15.

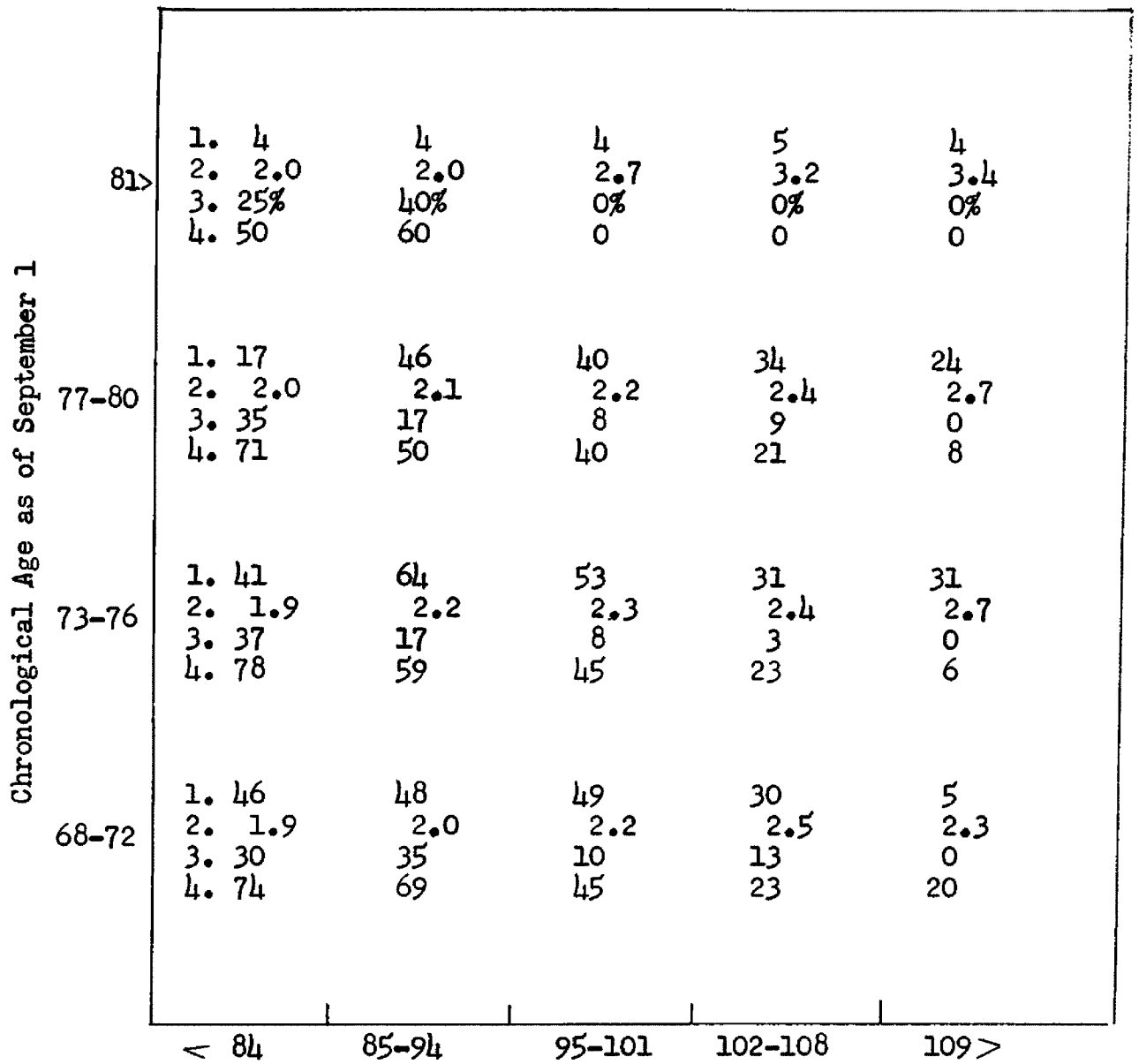
Sullivan, Elizabeth T. and others. "California Test of Mental Maturity, Primary Edition," Los Angeles: California Test Bureau, 1954.

Hildreth, Gertrude H. and others, "Metropolitan Achievement Test, Primary Battery, Form S," New York: World Book Company, 1947.

APPENDIX

APPENDIX A

CHRONOLOGICAL AND MENTAL AGE INFLUENCE ON SCHOOL ACHIEVEMENT



Key: 1. Number in the group
2. Average grade placement level for the group
3. Percent below the national norm
4. Percent below the Mankato average

APPENDIX B

TOTAL ACHIEVEMENT TEST SCORES MADE AT END OF SIXTH YEAR OF SCHOOLING BY CHILDREN WHO ENTERED GRADE I BEFORE AND AFTER SIX YEARS OF AGE

Younger Group Average I. Q. = 102						Older Group Average I. Q. = 100					
Pupil	Ach. Test Score	Pupil	Ach. Test Score	Pupil	Ach. Test Score	Pupil	Ach. Test Score	Pupil	Ach. Test Score	Pupil	Ach. Test Score
1	9.6	19	6.8	37	5.7	1	11.3	19	7.9	37	6.8
2	8.0	20	6.8	38	5.7	2	10.8	20	7.7	38	6.8
3	7.9	21	6.6	39	5.6	3	10.8	21	7.7	39	6.6
4	7.9	22	6.5	40	5.4	4	9.9	22	7.7	40	6.6
5	7.9	23	6.5	41	5.3	5	9.9	23	7.5	41	6.5
6	7.7	24	6.5	42	5.3	6	9.6	24	7.5	42	6.5
7	7.5	25	6.1	43	5.0	7	9.6	25	7.5	43	6.3
8	7.5	26	6.1	44	5.0	8	9.3	26	7.4	44	6.1
9	7.5	27	6.0	45	4.8	9	9.2	27	7.4	45	6.1
10	7.5	28	6.0	46	4.8	10	8.6	28	7.3	46	6.1
11	7.3	29	6.0	47	4.7	11	8.5	29	7.3	47	6.0
12	7.3	30	6.0	48	4.7	12	8.4	30	7.1	48	6.0
13	7.1	31	6.0	49	4.3	13	8.3	31	7.1	49	5.5
14	7.1	32	6.0	50	4.3	14	8.3	32	6.9	50	5.4
15	7.0	33	5.9	51	4.3	15	8.1	33	6.9		
16	7.0	34	5.8	52	4.2	16	8.1	34	6.9		
17	6.9	35	5.8	53	4.1	17	7.9	35	6.8		
18	6.9	36	5.8	54	3.8	18	7.9	36	6.8		

Mean = 6.20

Mean = 7.68

Normal Achievement = 6.9

Inez B. King, "Effect of Entrance Age Into Grade I Upon Achievement in Elementary School," Elementary School Journal, LV: (February, 1955), 331-336.

APPENDIX C

RAW DATA

Girls

Child	C.A.	M.A.	I.Q.	Ach. Test Score	Child	C.A.	M.A.	I.Q.	Ach. Test Score
1	6-0	96	119	3.0	39	6-2	108	123	3.0
2	6-8	92	96	1.9	40	6-10	108	115	2.6
3	6-2	92	110	2.9	41	6-1	101	166	2.4
4	6-2	85	91	2.3	42	6-9	84	89	2.3
5	6-4	90	100	2.4	43	6-7	116	125	2.6
6	5-9	92	136	3.3	44	6-1	143	164	3.5
7	6-0	87	101	2.5	45	6-3	87	98	1.8
8	6-0	89	105	1.8	46	6-3	77	105	2.1
9	6-4	94	103	2.6	47	5-11	81	114	2.2
10	5-11	80	91	1.9	48	6-8	85	108	1.8
11	6-2	87	99	1.9	49	6-7	90	116	2.4
12	5-11	87	102	2.9	50	6-6	100	130	3.0
13	6-4	90	100	2.3	51	6-2	95	128	2.6
14	6-4	89	99	2.6	52	6-1	84	97	1.7
15	6-5	93	102	2.1	53	6-0	95	111	1.8
16	6-4	101	112	2.1	54	6-5	97	107	2.3
17	6-2	80	91	2.0	55	5-11	107	126	1.7
18	6-3	93	104	2.8	56	5-9	82	99	1.7
19	6-8	77	82	2.0	57	6-6	105	114	1.8
20	6-0	91	108	2.0	58	6-6	108	116	2.0
21	6-6	93	101	2.8	59	6-4	101	112	2.6
22	6-0	108	126	3.3	60	6-2	108	124	2.2
23	6-3	87	98	1.5	61	6-7	110	118	2.2
24	5-10	101	120	2.2	62	6-6	140	152	2.9
25	6-8	93	99	2.3	63	6-7	90	97	1.7
26	5-10	99	117	1.9	64	6-7	101	106	2.4
27	6-5	91	100	2.5	65	5-9	78	94	1.5
28	6-5	101	111	2.6	66	6-6	105	115	3.4
29	6-5	101	111	2.5	67	6-6	99	107	1.9
30	6-3	99	111	2.3	68	6-1	107	125	2.4
31.	6-7	115	123	2.5	69	5-10	102	121	2.6
32	6-3	91	102	2.1	70	5-9	97	117	1.7
33	6-10	105	109	3.0	71	6-6	108	107	2.7
34	5-11	93	109	1.7	72	6-6	101	110	2.0
35	5-11	97	114	1.9	73	6-7	115	123	2.0
36	5-11	84	98	2.4	74	6-8	108	115	2.3
37	6-5	89	97	1.9	75	6-1	113	130	2.4
38	5-11	97	114	1.8	76	6-2	103	130	1.6

APPENDIX C (continued)

Girls

Child	C.A.	M.A.	I.Q.	Ach. Test Score	Child	C.A.	M.A.	I.Q.	Ach. Test Score
77	6-2	107	122	2.5	117	6-4	80	89	2.5
78	5-9	85	102	2.0	118	6-6	89	97	2.4
79	6-7	101	109	2.4	119	6-9	84	99	2.8
80	6-2	91	105	2.0	120	5-9	96	116	2.5
81	6-11	101	107	2.6	121	6-3	100	112	2.2
82	6-2	113	130	2.9	122	6-5	90	99	2.7
83	6-11	115	124	2.6	123	6-6	97	106	2.0
84	6-3	101	115	2.8	124	6-0	88	103	2.3
85	5-10	82	98	2.0	125	6-5	89	98	1.8
86	6-1	101	117	2.3	126	6-7	99	108	2.5
87	6-6	102	111	2.3	127	5-11	80	94	2.1
88	6-8	108	114	2.2	128	6-0	93	108	1.7
89	6-7	90	97	1.8	129	5-10	95	113	2.7
90	6-9	97	102	3.3	130	6-3	99	111	3.1
91	6-7	113	122	2.3	131	6-9	101	111	2.3
92	6-0	107	124	2.6	132	6-4	91	101	2.4
93	6-3	93	107	2.6	133	6-1	107	123	2.2
94	6-0	69	80	2.1	134	6-1	130	136	2.7
95	6-7	86	109	2.9	135	6-0	81	94	1.9
96	6-7	76	94	2.6	136	6-4	97	108	2.6
97	6-2	73	93	1.5	137	6-2	84	96	1.8
98	6-1	99	141	3.8	138	6-1	113	130	2.3
99	6-7	76	94	2.8	139	6-4	93	103	2.4
100	6-6	80	101	2.6	140	6-2	89	101	2.8
101	5-9	86	122	2.0	141	6-8	95	101	2.3
102	6-0	85	115	2.1	142	6-5	99	109	2.9
103	6-1	73	92	2.0	143	5-10	68	81	2.4
104	6-9	72	83	1.8	144	6-5	90	99	2.3
105	6-4	85	110	3.1	145	6-0	80	93	1.8
106	6-2	97	110	2.0	146	5-11	80	94	2.7
107	5-10	79	94	2.7	147	5-9	95	115	2.4
108	6-8	93	99	2.2	148	6-4	89	99	2.2
109	6-2	84	96	1.8	149	6-1	118	136	3.2
110	5-10	99	118	2.4	150	5-11	84	99	2.3
111	6-0	102	119	1.6	151	6-4	93	104	2.6
112	6-7	95	102	2.7	152	6-6	128	139	3.7
113	6-1	76	88	2.2	153	6-1	108	124	3.3
114	5-9	95	115	2.3	154	6-0	93	108	2.1
115	6-1	97	112	2.5	155	6-1	101	116	1.9
116	6-1	76	87	2.0	156	6-6	89	97	2.0

APPENDIX C (continued)

Girls

Child	C.A.	M.A.	I.Q.	Ach. Test Score	Child	C.A.	M.A.	I.Q.	Ach. Test Score
157	6-5	90	99	1.9	198	6-5	82	90	1.9
158	6-1	105	121	2.5	199	6-4	91	101	2.1
159	6-6	97	108	1.8	200	6-7	118	127	2.4
160	6-1	95	109	2.5	201	6-3	93	105	2.7
161	6-7	113	122	2.6	202	6-0	87	101	1.6
162	6-1	89	102	1.9	203	6-1	113	130	2.3
163	6-4	91	101	1.6	204	6-1	118	136	2.0
164	6-6	91	99	2.3	205	6-6	108	117	2.0
165	6-4	90	100	1.7	206	6-4	87	97	1.7
166	6-3	89	100	2.1	207	6-0	101	117	2.2
167	6-1	89	102	2.3	208	6-6	105	114	2.2
168	6-2	97	111	2.0	209	6-8	95	101	2.3
169	6-5	99	109	2.6	210	6-7	90	97	1.7
170	6-7	93	100	2.1	211	5-11	93	107	2.0
171	6-6	107	117	2.6	212	6-8	95	101	2.1
172	6-7	97	105	2.6	213	5-11	99	116	2.7
173	6-4	85	94	2.0	214	6-4	87	97	2.0
174	6-5	90	99	2.4	215	5-10	102	121	1.9
175	6-4	93	103	1.9	216	6-3	115	121	2.3
176	6-3	105	118	2.6	217	6-6	108	117	2.3
177	6-7	107	115	2.2	218	6-5	108	118	2.6
178	6-8	89	95	1.8	219	6-4	89	99	2.1
179	6-4	91	101	1.9	220	6-0	102	119	2.7
180	6-6	110	120	2.1	221	6-1	88	96	2.4
181	6-1	99	114	2.5	222	6-6	108	118	3.3
182	6-5	101	110	2.1	223	6-2	84	109	2.5
183	6-1	97	111	1.3	224	6-5	108	106	2.2
184	6-1	99	114	1.9	225	6-7	91	98	1.8
185	6-2	95	108	2.8	226	6-11	91	90	1.7
186	6-4	102	113	2.9	227	6-4	80	89	1.8
187	6-6	97	106	2.3	228	6-8	102	109	2.2
188	6-5	82	90	1.4	229	6-1	105	120	2.0
189	6-4	124	138	2.5	230	5-11	76	89	1.3
190	6-0	99	115	2.3	231	6-5	91	100	2.4
191	6-4	108	120	2.7	232	6-3	102	115	2.1
192	6-2	89	101	1.6	233	6-3	102	115	2.3
193	6-6	95	103	1.6	234	6-0	85	99	1.8
194	5-11	101	118	1.7	235	6-4	89	99	2.6
195	5-11	105	123	2.9	236	5-11	99	116	2.2
196	6-6	99	108	2.0	237	6-6	80	87	1.7
197	6-3	115	129	2.5	238	5-10	74	92	1.4

APPENDIX C (continued)

Boys

Child	C.A.	M.A.	I.Q.	Ach. Test Score	Child	C.A.	M.A.	I.Q.	Ach. Test Score
1	6-5	100	115	2.2	41	6-1	105	121	2.2
2	6-4	69	80	1.8	42	6-5	107	118	2.7
3	6-1	76	75	1.7	43	5-9	107	129	2.3
4	6-5	89	87	2.6	44	5-11	82	96	1.4
5	6-0	76	91	1.7	45	6-3	87	98	2.2
6	6-0	92	113	1.9	46	6-7	97	108	3.1
7	6-6	90	98	2.7	47	6-6	89	97	1.6
8	6-2	90	102	2.0	48	6-0	87	101	1.7
9	5-9	96	119	2.6	49	6-0	108	126	2.4
10	6-7	85	90	2.0	50	6-7	124	133	2.3
11	6-6	77	89	1.6	51.	6-7	97	104	2.0
12	6-3	100	118	2.4	52	5-8	90	110	1.6
13	5-10	108	129	2.4	53	5-11	105	124	2.6
14	5-1-	110	131	2.3	54	6-1	99	114	2.5
15	5-9	81	97	1.7	55	6-2	101	115	2.5
16	6-3	95	107	2.2	56	6-8	113	120	2.4
17	6-1	82	94	1.7	57	6-6	107	116	1.4
18	5-11	95	112	2.2	58	6-3	99	111	1.9
19	6-0	93	108	2.9	59	6-4	99	100	1.6
20	6-6	97	105	2.4	60	6-0	89	104	1.7
21	6-0	93	108	1.6	61	5-9	95	115	2.5
22	6-2	105	120	2.4	62	6-1	71	81	2.1
23	6-3	80	92	1.9	63	5-11	89	105	1.9
24	5-10	95	113	3.0	64	6-7	101	109	2.1
25	6-7	90	97	2.5	65	6-7	85	91	1.9
26	6-8	97	103	2.4	66	6-5	107	117	2.4
27	6-1	81	94	1.7	67	6-8	116	124	2.7
28	6-9	85	89	2.2	68	6-1	101	116	1.6
29	6-3	101	115	2.3	69	6-3	95	107	1.9
30	6-8	123	130	3.6	70	5-10	78	93	1.5
31	6-3	101	115	2.2	71	5-10	90	107	2.0
32	5-9	107	128	2.4	72	6-2	101	115	2.5
33	6-0	91	107	1.4	73	5-8	90	110	1.3
34	6-6	99	106	2.9	74	6-2	108	123	2.2
35	6-2	90	104	1.6	75	6-4	92	102	2.0
36	6-7	120	130	2.6	76	6-2	101	115	2.3
37	6-2	84	96	1.5	77	5-11	100	118	2.3
38	6-2	89	101	2.0	78	5-8	97	119	2.0
39	5-8	99	121	1.8	79	6-1	93	107	1.9
40	6-0	90	105	2.3	80	6-0	96	112	2.1

APPENDIX C (continued)

Boys

Child	C.A.	M.A.	I.Q.	Ach. Test Score	Child	C.A.	M.A.	I.Q.	Ach. Test Score
81	5-10	88	105	1.7	121	6-1	77	88	1.6
82	6-6	102	111	3.1	122	6-5	85	93	2.0
83	6-9	104	109	3.0	123	6-2	110	125	3.3
84	5-10	83	99	1.9	124	6-0	99	115	3.2
85	6-2	106	120	2.3	125	6-11	99	102	2.4
86	6-5	123	136	2.3	126	5-11	105	123	2.3
87	6-2	95	108	2.8	127	6-0	91	106	3.2
88	6-3	105	118	2.4	128	6-3	91	111	2.0
89	6-3	84	94	2.0	129	6-0	81	94	2.5
90	5-9	97	117	2.2	130	5-11	80	94	2.3
91	5-10	80	94	1.9	131	6-4	118	131	2.9
92	5-8	99	121	2.3	132	6-4	107	111	3.2
93	6-6	89	97	2.2	133	6-6	107	116	2.9
94	6-1	80	92	1.8	134	6-2	81	108	2.3
95	6-2	87	99	2.3	135	6-6	75	93	1.7
96	6-1	108	124	2.5	136	6-7	79	97	2.0
97	6-7	96	103	2.2	137	6-8	116	116	3.4
98	6-0	79	92	2.5	138	6-0	99	115	2.3
99	6-1	87	100	1.7	139	6-7	102	109	2.0
100	6-6	107	116	3.5	140	6-4	115	127	2.8
101	5-10	90	107	2.8	141	6-2	128	145	2.3
102	6-3	88	99	1.2	142	5-11	77	90	1.4
103	6-4	90	100	3.0	143	6-6	97	105	2.2
104	5-9	96	116	2.1	144	6-2	91	103	1.9
105	5-10	80	95	1.1	145	6-4	89	99	1.6
106	6-7	97	104	2.2	146	6-8	91	97	1.8
107	6-5	120	132	2.4	147	5-9	84	101	2.0
108	6-8	81	90	2.9	148	6-6	105	114	2.2
109	5-11	102	120	3.5	149	6-2	95	108	2.1
110	6-1	78	90	2.3	150	6-1	166	133	2.8
111	5-11	113	133	1.9	151	5-9	76	91	1.8
112	6-7	85	90	1.6	152	6-1	89	102	1.4
113	6-7	97	104	2.7	153	5-11	90	106	1.7
114	5-11	84	99	2.0	154	5-10	97	115	2.9
115	6-0	81	94	2.2	155	5-9	99	119	2.0
116	6-2	82	93	1.5	156	6-4	101	112	2.4
117	6-8	95	101	2.2	157	6-7	102	110	1.5
118	6-7	90	97	2.6	158	6-2	118	134	4.2
119	5-11	85	100	1.8	159	6-7	120	120	2.3
120	6-2	75	85	1.5	160	6-9	125	131	3.1

APPENDIX C (continued)

Boys

Child	C.A.	M.A.	I.Q.	Ach. Test Score
241	6-8	87	93	2.0
242	6-4	89	99	1.9
243	5-10	84	100	1.9
244	6-0	93	108	2.4
245	6-7	95	102	2.0
246	6-1	87	110	2.5
247	6-3	97	105	2.2
248	6-3	89	100	1.7
249	5-11	99	117	2.6
250	6-7	82	88	2.0
251	6-3	118	133	2.8
252	5-10	97	114	2.1
253	6-9	120	126	3.6
254	6-4	97	108	1.7
255	6-1	89	102	2.0
256	6-5	124	136	4.1
257	6-7	115	124	2.8
258	6-3	76	85	1.6
259	5-10	101	120	1.7
260	6-0	91	106	2.2
261	6-4	99	110	1.9
262	6-5	95	105	1.7
263	6-3	115	129	4.1
264	5-9	102	123	2.5
265	6-4	97	108	2.1
266	5-9	95	115	2.0
267	6-3	115	129	2.4
268	6-1	79	91	2.2
269	5-11	102	120	2.2
270	5-11	102	120	3.9
271	6-4	107	119	2.2
272	5-9	85	105	2.5
273	5-1	93	124	2.8